UNITED STATES PATENT APPLICATION

OF

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FOR

FM TRANSMITTER AND POWER SUPPLY/CHARGING ASSEMBLY FOR MP3 PLAYER

INTELLECTUAL PROPERTY/TECHNOLOGY LAW • P.O. BOX 14329 • RESEARCH TRIANGLE PARK, NC 27709

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of U.S. Patent Application No. 10/197,367 filed July 17, 2002 in the name of Jeff Grady for "FM TRANSMITTER AND POWER SUPPLY/CHARGING ASSEMBLY FOR MP3 PLAYER," issuing July 8, 2003 as U.S. Patent 6,591,085.

BACKGROUND OF THE INVENTION

Field Of The Invention

This invention relates to accessories for MP3 players used for on-line downloading, storage and playing of music. More specifically, the invention relates to an FM transmitter and power supply/charging assembly for such MP3 players, and to a kit comprising such assembly in combination with other mounting/power/charging accessories.

Description Of The Related Art

Music players of widely varying type are ubiquitous throughout the world, and have evolved through various forms over the years, from portable single transistor radios in the 1950's to tape cassette players to compact disc players and more recently to MP3 players, which enable a user to download audio material from an internet site and store same in storage medium of a player in an MP3 (MPEG-1 audio layer 3) format for subsequent selective listening.

A number of MP3 players have been developed and are commercially available, including the Nomad jukebox commercially available from Creative Labs, SonicBlue's rio volt, jukebox recorder commercially available from Archos Technology, and numerous others. A high-capacity MP3 player of such type is the iPOD™ MP3 player commercially introduced by Apple Computer, Inc. (Cupertino, CA) in 2001. The Apple iPOD has a capacity for approximately 1000 songs of commercial play length.

MP3 players of the aforementioned type rely on batteries for their portability, and are typically provided with a headset for user listening.

One problem associated with the small size and light-weight characteristics of such MP3 players, as requisite to their portability and ease of use, is battery life. Another problem is the personal character of the headphone-equipped MP3 player. The MP3 player may be equipped with a speaker, but its small size and light-weight characteristics limit the size of the speaker, making it less than desirable when it is desirable to transmit music to a group of persons, such as in a vehicle passenger compartment, or a room.

SUMMARY OF THE INVENTION

The present invention relates in one embodiment to an FM transmitter and power supply/charging assembly for an MP3 player.

In one embodiment, the FM transmitter and power supply/charging assembly comprises a unitary and modular docking unit, in which the MP3 player is reposable in electrical communication therewith. The docking unit in a specific embodiment accommodating the iPOD™ MP3 player, the docking unit interconnects with the MP3 player via the MP3 player headphone and firewire ports. In other embodiments, accommodating MP3 players without firewire ports, the docking unit may interconnect with the MP3 player via the headphone and power port. The base docking unit contains within the unitary housing an FM transmitter and firewire power plug for the MP3 player. The base docking unit is provided with a matable plug coupling, for joining of the base docking unit to any of suitable power/charging components attachable thereto.

In another embodiment, the base docking unit of the FM transmitter and power supply/charging assembly is provided as a component of a multi-accessory kit. The kit comprises, in addition to the base docking unit, a ratcheting arm coupleable with a cigarette lighter power socket, e.g., a conventional 12 volt socket, in which the arm also functions as a mounting device which is pivotably adjustable to spatially position the MP3 player and affixed docking unit in any of a variety of spatial positions, relative to the user. The kit optionally also includes a short adaptor coupleable with a power supply, e.g., in a desk mount or wall mount plate. The kit optionally further includes a desk mount that is engagable with the short adaptor, to provide a desk mountable conformation of the MP3 player, and/or a wall mount plate for wall mounting of the FM transmitter and power supply/charging assembly, so that the MP3 player may be disposed in the modular docking unit as wall mounted.

Other aspects, features and advantages of the present invention will be more fully apparent from the ensuing disclosure and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front elevation view of an FM transmitter and power supply/charging assembly according to one embodiment of the present invention.

Figure 2 is a rear elevation view of the FM transmitter and power supply/charging assembly of Figure 1.

Figure 3 is a right-hand side view, in elevation, of the assembly of Figures 1-2.

Figure 4 is a bottom plan view of the assembly of Figures 1-2.

Figure 5 is a top plan view of the assembly of Figures 1-2.

Figure 6 is a left-hand side view, in elevation, of the assembly of Figures 1-2.

Figure 7 is a front elevation view of the FM transmitter and power supply/charging assembly of Figure 1, with an MP3 player mounted therein.

Figure 8 is a schematic representation of an audio system including the modular docking unit of the FM transmitter and power supply/charging assembly of the invention, having an MP3 player mounted therein, and arranged in FM transmitting relationship to an FM receiver having audio speakers attached thereto.

Figure 9 is a pivotably adjustable ratchet adaptor, which is coupleable with a cigarette lighter power socket, e.g., a conventional 12 volt socket, wherein the outer coupling end of the adaptor is engagable with the port on the rear face of the docking unit of the FM transmitter and power supply/charging assembly, with the ratchet arm being pivotably adjustable to spatially position the MP3 player at a given orientation relative to a user.

Figure 10 is a short adaptor coupleable with the coupling structure on the rear face of the docking unit of Figures 1-6, wherein the adaptor includes a wall mounting plate, accommodating wall mounting of the FM transmitter and power supply/charging assembly.

Figure 11 is a desk mount device, in which the short adaptor of Figure 10 may be reposed, to provide desktop access of a user to the MP3 player as reposed in the docking unit coupled with the adaptor mounted on the desk mount article.

Figure 12 is a front elevation view of an FM transmitter and power supply/charging assembly, according to another embodiment of the present invention.

Figure 13 is a left-hand side view, in elevation, of the assembly of Figure 12.

Figure 14 is a bottom plan view of the assembly shown in Figure 12.

Figure 15 is a rear elevation view of the FM transmitter and power supply/charging assembly of Figure 12.

Figure 16 is a right-hand side view, in elevation, of the assembly of Figure 12.

Figure 17 is a top plan view of the FM transmitter and power supply/charging assembly shown in Figure 12.

Figure 18 is a perspective view of an MP3 player having a connector adapted for coupling with a firewire port or a USB port.

Figure 19 is a schematic front elevation view of an FM transmitter and power supply/charging assembly according to another embodiment of the invention, arranged for mounting therein of an MP3 player of the type shown in Figure 18.

DETAILED DESCRIPTION OF THE INVENTION, AND PREFERRED EMBODIMENTS THEREOF

The present invention provides an integrated FM transmitter and power supply/charging assembly for an MP3 player, that dramatically increases the utility of the basic MP3 player.

The FM transmitter in the assembly of the invention transmits music played through the MP3 player to a range of FM frequencies, enabling FM reception of audio music signals that then can be played through an FM receiver, such as an FM radio receiver in a vehicle, a FM radio in proximity to the FM transmitter, and otherwise for extended area broadcast of the MP3 player-originated music.

As one example, the base dock unit of the FM transmitter and power supply/charging assembly may be deployed in an automobile or other vehicular environment, wherein the unit is powered by a power adaptor plugged into a cigarette lighter socket of the vehicle. The FM transmitter then transmits the MP3 player-originated music to the FM receiver in such vehicle, enabling the acoustic system of the vehicle to be employed for broadcast of the music to the interior passenger compartment of the vehicle.

The FM transmitter and power supply/charging assembly may as hereinafter described more fully comprise an AC charger enabling the battery of the MP3 player to be

recharged to a more fully charged state allowing its use to be lengthened while on battery power.

The FM transmitter and power supply/charging assembly may be provided in a kit including the base docking unit and various adaptor/charger/mount accessories, as hereinafter described.

Although the ensuing discussion is directed to an embodiment having specific use and applicability to the iPOD MP3 player, it will be recognized that the utility of the invention is not thus limited, but rather extends to and encompasses other MP3 players. Accordingly, although the iPOD MP3 player utilizes a firewire port for power connection purposes, other types of port and electrical connection means may be employed.

Referring now to the drawings, Figure 1 shows a front elevation view of an FM transmitter and power supply/charging assembly **10** having a main body portion **12** including a back wall whose surface **14** together with side rails **18** and **20** define a cavity in which the MP3 player is selectively reposable. The FM transmitter and power supply/charging assembly will be referred to hereinafter as the modular docking unit.

As shown in Figure 1, the modular docking unit is provided with a male connector element **26** matably engagable with the headphone port of the MP3 player, as well as a coupling **28** matably engagable with the firewire port of the MP3 player.

In the housing of the modular docking unit is provided an FM transmitter, which transmits music played through the MP3 player to a range of FM frequencies. The FM transmitter may be of any suitable type, and operates to transmit music to an FM receiver in the vicinity of the MP3 player.

The FM transmitter may for example be provided having a tuning frequency in the FM band of 88-95 megaherz (MHz) and a transmission range of 4-6 feet or more. Stereo transmitters of such type are readily commercially available, and are of appropriate size for incorporation in the modular docking unit.

The FM transmitter may simply transmit at a frequency fixed in the aforementioned 88-95 MHz band, or the transmitter may be tunable to select a specific frequency within such spectrum.

In operation, the FM receiver receives the transmitted audio from the MP3 player transmitted by the modular docking unit, and the FM receiver, e.g., in a user's automobile, then is able to transmit the audio content to the vehicular sound system, e.g., by tuning the FM receiver to the frequency of the transmitter in the modular docking unit.

The modular docking unit in the interior of its housing also includes circuitry and components for charging the battery of the MP3 player, through the firewire power port or other electrical input port (e.g., USB or other port) to charge the MP3 player's battery, as well as providing power to the MP3 player when docked in the modular docking unit.

As shown in Figure 1, the modular docking unit has on a lower portion **22** thereof indicator lights **30** and **32**, which are configured for indicating when the MP3 player is charging or fully charged, and/or when the MP3 player is "ON."

The modular docking unit may also be provided with an ON/OFF switch, or selectively actuating the MP3 player, charging function of the modular docking unit, etc.

Figure 2 is a rear elevation view of the MP3 player, showing the back wall surface **34**, on which is provided a boss **37** forming a coupling cavity **36** including a power connector element **38**. The housing of the modular docking unit may be of a 2-piece construction, with mechanical fastener elements **40**, **42**, **44** and **46** serving to couple the respective parts of the unit. Alternatively, the modular docking unit may be formed of a unitary molded material, having a port or opening therein for insertion and assembly of the interior components, including circuitry and components as described hereinabove.

Figure 3 is a right-hand side elevation view of the modular docking unit, showing the retention member **24** at the upper portion of the housing. Figure 4 is a bottom plan view of the modular docking unit, including a further mechanical fastener **50** for retaining interior assembly elements of the unit.

Figure 5 is a top plan view of the modular docking unit, showing the retention member **24**, which is selectively disengagable by thumb-actuatable release member **54**.

Figure 6 is a left-hand side elevation view of the modular docking unit, showing the symmetrical character of same relative to the view illustrated in Figure 3.

Figure 7 illustrates the FM transmitter and power supply/charging assembly **10** having an MP3 player **56** disposed in the cavity of the body **12**.

Figure 8 is a corresponding view of MP3 player **56** mounted in the body **12** of the FM transmitter and power supply/charging assembly **10**. In this configuration, the modular docking unit is mounted on a pedestal **60** having an arm extending upwardly at the rear of the modular docking unit and coupling with the power element **38** on boss **37** (see Figures 2, 3 and 6). The pedestal **60** is provided with an electrical coupling **62** accommodating power plug **64** connected to power cord **66**, providing power to the pedestal **60** for transmittal through contact **38** to the MP3 player by element **28**, as shown in Figure 1.

When the MP3 player is actuated to play the stored audio content, the corresponding signal is transmitted through coupling element **26** shown in Figure 1 to the FM transmitter in the housing of the modular docking unit, generating an FM signal that is transmitted to FM receiver **68** powered by power cord **70**. The FM receiver **68** in turn is coupled by speaker wires **74** and **78** to speakers **72** and **76**, respectively. In such manner, the audio content played by the MP3 player **56** is transmitted by the FM transmitter to FM receiver **68** and outputted as sound output at speakers **72** and **76**.

Concurrently, the MP3 player can be electrically charged to renew the battery power of the unit, so that when undocked from the modular docking unit, the MP3 player may be outfitted with earphones and deployed in a personal listening arrangement.

Although the Figure 8 embodiment is shown as including a table-type FM receiver, it will be recognized that the arrangement is illustrative only, and is adaptable to automotive or vehicular sound systems including an FM receiver.

The modular docking unit as shown in Figures 1-6 may be coupled with a power source in any suitable manner.

Figure 9 shows a ratchet-type adaptor **80** including engagement structure **82** matable with the cavity **36** shown in Figure 2 on the modular docking unit. The coupling structure **82** is at the face of tubular member **81** which is pivotably mounted on spindle **84** which is positionable by means of the manual wing-nut **86**, which is selectively manually tightenable or loosenable, to adjust the attitude of tubular member **81** relative to the main body **88** of the adaptor. The main body **88** is joined to a plug end **90** featuring electrical contact elements **92** and **94**, for engagement of the plug end **90** with a corresponding socket, such as a cigarette lighter socket of a motor vehicle.

Figure 10 shows another adaptor **96** having engagement structure **98** at the extremity of cylindrical member **100** mounted on plate number **102**. The engagement structure **98** is engagable with the cavity **37** at the rear face of the modular docking unit (see Figure 2).

The plate **102** shown in Figure 10 is provided with mounting openings **104**, **106** and **108**, for wall-attachment of the adaptor, using mounting screws, nails, etc.

The adaptor shown in Figure 10 permits the modular docking unit to be wall-mounted, whereby the MP3 player may be selectively docked and undocked from the wall-mounted modular docking unit.

Figure 11 is a perspective view of a desk mount article **120**, in which the short adaptor **96** shown in Figure 10 may be selectively reposed, or coupling with the desk mount article **120** joined to power cord **122**.

The modular docking unit as shown in Figures 1-6 may thereby be coupled with the adaptor **96** of the desk mount article by engagement of the engagement structure with the cavity **37** and electrical coupling **38** as shown in Figure 2.

Figure 12 is a front elevation view of an FM transmitter and power supply/charging assembly **200**, or modular docking unit, according to another embodiment of the present invention.

The modular docking unit **200** includes a main body portion **212** defining a cavity for selectively reposing the MP3 player therein. The cavity is bounded by back wall **214** and side rails **218** and **220**. Extending into the cavity is a male connector **226**, which may serve to couple the modular docking unit with the headphone jack of the MP3 player, as well as a coupling **228** matably engagable with the firewire port of the MP3 player. The cavity as shown is also bounded by laterally inwardly facing elements, which serve as inwardly extending tabs on the respective side rails, to assist in retaining the MP3 player in position in the cavity during audio play, storage or charging of the player.

On the upper portion **222** of the modular docking unit **200** in the position shown, is provided an LED power indicator light **230**, and a firewire port adjustment switch **221**, which serves to laterally reposition the coupling **228** in the cavity, so that the coupling is placed in register with the firewire port of the MP3 player.

On the lower portion of the modular docking unit **200** in the position illustrated in Figure 12, a retractable security shelf member **224** is provided. The shelf member **224** can be selectively manually adjusted to a forward position to assist in retaining the MP3 player in the cavity of the unit, so that the MP3 player is positionally fixtured in the cavity of the modular docking unit during use or charging of the MP3 player.

In the ensuing Figures 13-17, all parts and structural features of the modular docking unit are correspondingly numbered to the same parts and structural features as shown in Figure 12, for ease of reference.

Figure 13 is a left-hand side view, in elevation, of the modular docking unit **200** of Figure 12, showing the boss **237** on the rear surface of the unit and the protruding power connector element **238**. A headphone jack **219** is provided on the side surface of the unit, as shown, for selective use of the modular docking unit in a headphones-engaged listening mode when an MP3 player is mounted in the unit.

Figure 14 is a bottom plan view of the modular docking unit shown in Figure 12, showing the retractable security shelf **224**. The shelf member includes a ridged surface to facilitate engagement with the thumb or other digit of the user, in selectively extending the shelf forwardly to secure the MP3 player in position, or alternatively to retract the shelf so that the MP3 player can be removed from the modular docking unit.

Figure 15 is a rear elevation view of the modular docking unit of Figure 12, showing the boss **237** on the back wall surface **234**. The boss **237** forms a coupling cavity **236** including the power connector element **238** therein. The housing of the modular docking unit of this embodiment can be of two-piece construction, wherein each of the front and back sections of the housing are secured to one another by means of mechanical fasteners **240**, **242** and **244**, as shown. The housing of the modular docking unit may alternatively be formed of single-piece construction, or otherwise formed and fabricated in a suitable manner facilitating the assembly of the unit.

Figure 16 is a right-hand side view, in elevation, of the assembly of Figure 12, showing the boss **237** on the back wall surface and the power connector element **238** protruding therefrom. The retractable security shelf **224** is shown at the bottom of the unit in the view illustrated, and the firewire port adjustment switch **221** is shown protruding from the upper end of the unit.

Figure 17 is a top plan view of the modular docking unit shown in Figure 12, with the firewire port adjustment switch **221** protruding from the front surface of the main body portion **212** of the unit.

Figure 18 is a perspective view of an MP3 player **256** having a connector **259** adapted for docking with a firewire port or a USB port. The MP3 player **256** illustrated in Figure 18 is an iPOD™ MP3 player, available from Apple Computer, Inc., Cupertino, CA, although other MP3 players can be used with the modular docking unit of the invention.

Figure 19 is a schematic front elevation view of a modular docking unit **300** according to another embodiment of the invention, arranged for mounting therein of an MP3 player of the type shown in Figure 18. The modular docking unit **300** includes a housing **312** defining a cavity therein bounded by back wall surface **314** and the side rails **318** and **320** of the housing. At the bottom extremity of the cavity is positioned a dock connector **327** that mates with the connector **259** of the MP3 player **256** (see Figure 18).

The modular docking unit **300** has on a lower portion of the housing, on a frontal surface thereof, a frequency indicator display **330**, which in the drawing indicates a frequency of 102.5 megahertz (MHz) being transmitted by the transmitter in the docking unit. Below the frequency indicator display is a tuning control **332**, which can be variously configured as a membrane switch, as a thumb-wheel control, or other control member that is selectively actuatable to increase or decrease the transmitter frequency, as desired.

To the right of the frequency indicator display **327** on the lower portion of the housing **312** is a power indicator **334**, which may comprise an LED or other suitable element indicating the power "ON" or "OFF" status of the unit. Adjacent to the power indicator **334** is an FM transmitter indicator element **336** which may likewise comprise an LED or other suitable element indicating the "ON" or "OFF" status of the FM transmitter disposed in the housing.

The modular docking unit **300** of Figure 19 is shown as coupled to a flexible 12-volt cigarette lighter adapter **350**, to enable the unit to be powered from the electrical system of a vehicle, by plug-in of the adapter **350** into the cigarette lighter of the vehicle. The connected modular docking unit **300** then is situated to receive the MP3 player in the cavity of the housing, and to be actuated to transmit audio from the MP3 player to the sound system of the vehicle in which the modular docking unit is mounted.

It will therefore be recognized that the FM transmitter and power supply/charging assembly of the present invention may be widely varied in specific structure, while

providing FM transmission ability to the MP3 player docked therein, and concurrently providing charging capability to the MP3 player battery, as well as power during docked usage of the MP3 player.

The various adaptor units shown, as well as the associated mounting articles, may be provided as a kit together with the FM transmitter and power supply/charging assembly, to provide a package of alternative parts for varied deployment of the docked MP3 player.

While the invention has been described herein with respect to various illustrative aspects, features and embodiments, it will be recognized that the invention is not thus limited, but that the present invention extends to and encompasses other features, modifications, and alternative embodiments, as will readily suggest themselves to those of ordinary skill in the art based on the disclosure and illustrative teachings herein. The claims that follow are therefore to be construed and interpreted as including all such features, modifications and alternative embodiments, within their spirit and scope.